UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/817,417	03/30/2004	Hongyu Yue	071469-0307692	1294

909 7590 02/28/2007

PILLSBURY WINTHROP SHAW PITTMAN, LLP
P.O. BOX 10500
MCLEAN, VA 22102

EXAMINER	
CHEN, KIN CHAN	
ART UNIT	PAPER NUMBER
1765	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
2 MONTHS	02/28/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/817,417
Filing Date: March 30, 2004
Appellant(s): YUE ET AL.

E. Rico Hernandez
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed December 26, 2006 appealing from the Office action mailed June 20, 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

2004/0185583	Tomoyasu et al.	9-2004
2004/0097047	Natzle et al.	5-2004
2004/0241981	Doris et al.	12-2004

Wadsworth,H.M."Handbook of statistical methods of engineers and scientists" chapter 18, pp 18.1-18.5.

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-6, 8, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomoyasu et al. (US 2004/0185583) as evidenced by Wadsworth (Handbook of statistical methods for engineers and scientists).

In a method for removing chemical oxide on a substrate, Tomoyasu teaches that trim amount data as a function of time for a process recipe may be acquired. A relationship between a value related to the trim amount data and time may be determined. The target trim amount and the relationship may be used to determine a target trim time for achieving the target trim amount. The feature on the substrate may be chemically treated using the process recipe for the target trim time. The target trim amount may be substantially removed from the feature. Tomoyasu also teaches thermally treating the substrate and rinsing the substrate following the chemical treating. Tomoyasu teaches varying flow rates of HF, NH_3, and argon. Tomoyasu also teaches varying pressure, and temperature. Tomoyasu teaches treating a silicon oxide feature. See abstract; [0007], [0059]-[0064], [0074], [0200].

Tomoyasu teaches trim amount data as a function of time. Tomoyasu teaches SPC charts, and various statistics models and tools may be used, see [0074]. Hence, after completing data collections in various process conditions, it would have been obvious to one with ordinary skill in the art to apply commonly used engineering calculation, curve fitting techniques and statistical tools to determine and cure fit the relationship between trim time and trim amount. As such, log relationship (e.g., claims 1 and 9), or exponential relationship (e.g., claim 8) would have been expected in some

results when using various process conditions. See also statistical tool of non-linear regression in Wadsworth (Handbook of statistical methods for engineers and scientists) as evidence. Wadsworth shows the way to curve fit experimental data in log relationship or exponential relationship.

Claims 1, 4-6, 8, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Natzle et al. (US 2004/0097047) as evidenced by Wadsworth (Handbook of statistical methods for engineers and scientists).

In a method for removing chemical oxide on a substrate, Natzle teaches that a chemical oxide removal process may be performed using a process recipe including a first reactant and a second reactant. Natzle [0042] teaches acquiring trim amount data as a function of variable parameters (such as, time, temperature, composition, residence time, pressure of the reactant, the amount of reactant or the rate of reactant), all of which can be regulated. Natzle [0042] also discloses that the aforementioned variable parameters influence the amount removed. Therefore, it would have been obvious to one with ordinary skill in the art that trim amount data as a function of time for a process recipe may be acquired. A relationship between a value related to the trim amount data and time may be determined. The target trim amount and the relationship may be used to determine a target trim time for achieving the target trim amount. Natzle teaches that the feature on the substrate may be chemically treated using the process recipe for the target trim time. The target trim amount may be substantially removed from the feature. Natzle teaches varying flow rates of HF, NH_3, pressure, and temperature. See [0014] [0037] [0038] [0042]-[0044].

As to dependent claim 6, Natzle teaches treating a silicon oxide feature, see [0014].

After gathering information of etching rates, thickness (trim amount) as function of time, process parameters) in various process conditions, it would have been obvious to one with ordinary skill in the art to tabulate / extrapolate / manipulate data and perform calculation using common engineering and statistical methods (such as regression, extrapolation, best-fit, polynomial, least squares, interpolation). As such, log relationship (e.g., claims 1 and 9), or exponential relationship (e.g., claim 8) would have been expected in some results when using various process conditions. See also statistical tool of non-linear regression in Wadsworth (Handbook of statistical methods for engineers and scientists) as evidence. Wadsworth shows the way to curve fit experimental data in log relationship or exponential relationship.

Claim 5 differs from Natzle by specifying well-known features (such as adding inert gas of argon to the etchant as a process gas and determining the effect on the etching) to the art of semiconductor device fabrication, the examiner takes official notice. It is the examiner's position that a person having ordinary skill in the art at the time of the claimed invention would have found it obvious to incorporate inert gas to same in order to provide their art recognized advantages and produce an expected result with a reasonable expectation of success.

It is noted that appellants did not traverse the aforementioned conventionality (e.g., well-known features and common knowledge), which have been stated in the previous office action (January 10, 2006).

Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Natzle as applied to claim 1 above, and further in view of Doris et al. (US 2004/0241981; hereinafter "Doris").

The discussion of modified Natzle from above is repeated here.

Natzle is silent about the heating and rinsing with water after the chemical treating. In a method for chemical oxide removing, Doris teaches heating and rinsing with water after the chemical treating so as to efficiently remove the solid reaction product, see [0046]. Hence, it would have been obvious to one with ordinary skill in the art to modify Natzle by heating and rinsing with water as taught by Doris in order to efficiently remove the solid reaction product.

(10) Response to Argument

Appellants have argued that Tomoyasu does not teach fitting the trim amount data as the function of time with a log relationship. It is not persuasive. As has been stated in the office action, Tomoyasu teaches trim amount data as a function of time. Tomoyasu teaches SPC charts, and various statistics models and tools may be used, see [0074]. Hence, after completing data collections in various process conditions, it would have been obvious to one with ordinary skill in the art to apply commonly used engineering calculation, curve fitting techniques and statistical tools to determine and cure fit the relationship between trim time and trim amount. As such, log relationship would have been expected in some results when using various process conditions. See also statistical tool of non-linear regression in Wadsworth (Handbook of statistical

methods for engineers and scientists) as evidence. Wadsworth shows the way to curve fit experimental data in log relationship or exponential relationship.

Appellants have argued that there is no motivation or suggestion to apply commonly used curve fitting techniques and statistical tools to determine the relationship between trim time and trim amount. It is not persuasive. The examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Performing engineering calculation such as curve fitting techniques and statistical tools is the knowledge generally available to one of ordinary skill in the art (basic course requirement for undergraduate engineering). See example of Wadsworth (Handbook of statistical methods for engineers and scientists, chapter 18, 18.1-18.5) which shows the way to curve fit experimental data in log relationship or exponential relationship.

Appellants have argued that Natzle does not teach fitting the trim amount data as the function of time with a log relationship. It is not persuasive. As stated in the office action, after gathering information of etching rates, thickness (trim amount) as function of time, process parameters) in various process conditions, it would have been obvious to one with ordinary skill in the art to tabulate / extrapolate / manipulate data and perform calculation using common engineering and statistical methods (such as

regression, extrapolation, best-fit, polynomial, least squares, interpolation). As such, log relationship would have been expected in some results when using various process conditions. See also statistical tool of non-linear regression in Wadsworth (Handbook of statistical methods for engineers and scientists) as evidence. Wadsworth shows the way to curve fit experimental data in log relationship or exponential relationship.

Appellants have also argued that there is no motivation or suggestion to apply commonly used curve fitting techniques and statistical tools to determine the relationship between trim time and trim amount. It is not persuasive. The examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Performing engineering calculation such as curve fitting techniques and statistical tools is the knowledge generally available to one of ordinary skill in the art . See example of Wadsworth (Handbook of statistical methods for engineers and scientists, chapter 18, 18.1-18.5) which shows the way to curve fit experimental data in log relationship or exponential relationship.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Kin-Chan Chen
Primary Examiner
Art Unit 1765

January 29, 2007

Conferees:

Nadine Norton - SPE 1765

Jennifer ~~Kolb~~ Michener

QAS

JENNIFER MICHENER
QUALITY ASSURANCE SPECIALIST